THE MAIN ACHIEVEMENTS OF SCIENTIFIC AND ORGANIZATIONAL ACTIVITIES OF PROFESSOR JALAL A.ALIYEV

Sixty-five years of dynamic researches of Professor ***Jalal A.Aliyev*** have been devoted to the study of the theory of photosynthetic activity as a fundamental process behind the productivity of crop plants. His research has focused mainly on a very important crop: wheat. His research has focused on an integrative approach that involved physiological, biophysical, biochemical, and molecular-genetic bases of plant productivity, as well as on the production at the levels of structural-functional organization of plants - from molecular to the whole plant and field. On these ground the following can be underlined:

- The scientific principles determining productivity and high-yield capacity of “ideal” type of wheat were developed;
- CO_2 exchange of plants was investigated in sowings and a wide range of variability of carbonic acid assimilation depending upon the morphophysiological attributes of genotypes and their donor-acceptor relations was established;
- Carbon metabolism, transport and distribution of assimilates formed in both leaves and ear of contrast genotypes using $^{14}CO_2$ were studied and important role of separate organs in grain filling was confirmed;
- Contrary to earlier conception arisen during many years on the about wastefulness of photorespiration, versatile investigations on CO_2 exchange intensity, carbon metabolism and RBPC/O activity using various wheat genotypes contrasting on productivity and grown in field conditions confirm that photorespiration is one of the evolutionarily developed vital metabolic processes in plants and the attempts to reduce this process by various ways with the purpose of increasing the crop productivity are inconsistent. The complete nucleotide and deduced amino acid sequences of key enzymes of photosynthesis and photorespiration - phosphoenolpyruvate carboxylase and phosphoglycolate phosphatase were determined;
- On the basis of a long-term study of the mineral nutrition physiology in the life of plants, macro- and microelements application system and new manufacturing capsulated nitric fertilizer technology with programming release of nitrogen from capsule were developed;
- The laws of distribution of long-living nuclides ^{90}Sr and ^{137}Cs in a soil-vegetative cover were revealed, the forecasts of the possible pollution of the plant were established and appropriate practical recommendations were developed;
- Structural-molecular organization of chloroplast photochemical systems was studied and the model of topography of pigment-protein complexes in thylakoid membrane was suggested.
- Structural-molecular relations in photosynthetic membranes were investigated and the mechanisms of charge dynamics in reaction centers and in the water oxidation centre of photosystem II were suggested;
- Photosynthetic ability of chloroplasts in ontogenesis of different wheat genotypes was studied;
- The synthesis and assembly of pigment-protein complexes in photosynthetic membranes were studied and molecular-genetic mechanisms of their formation were elucidated;

- Key enzymes of photosynthesis were studied; structural and functional organization of plant carbonic anhydrase was investigated in detail. The carbonic anhydrase was isolated and crystallized from *Cicer arietinum* leaves for the first time and molecular model of its quaternary structure was proposed;
- The genome library of *Cicer arietinum* chloroplast DNA was created, the transfer of foreign gene by vector systems was carried out and plant-regenerates were obtained;
- The specific CAPS markers were developed to distinguish the genomes in the tribe *Triticeae*;
- The induced morphogenesis in wheat cell culture was obtained and plants were reconstructed as initial material for selection;
- The biochemical pathways of extracellular signal transduction triggered by surrounding stimulus were studied;
- The possible role of photosynthetic changes in adaptation of plants to extreme conditions of cultivation was studied;
- Loci and genes responsible for drought and salt tolerance were found using different molecular markers in wheat plants;
- For the first time in Azerbaijan phytoplasma and single-stranded cyclic DNA containing viruses were detected in fruit and vegetable plants and were completely identified at the molecular level;
- For the first time 'Ca. P. brasiliense', new for the Old World, was detected in a peach tree in Azerbaijan other than hibiscus and from a location outside of Brazil;
- Database of plant promoters, computer programs for the prediction of RNA polymerase II promoters and potential regulatory elements of transcription have been developed. Some peculiarities of organelle-to-nucleus DNA transfers, organization and expression of genes in nuclear genomes of rice and Arabidopsis have been revealed;
- An idea about so-called "good "photosynthesis and "ideal" wheat was conceived;
- The richest wheat Gene Pool including several thousands of genotypes was created;
- A large number of durum (*Triticum durum* Desf.) and bread (*Triticum aestivum* L.) wheat genotypes, such as Garagylchyg-2, Vugar, Shiraslan-23, Barakatli-95, Alinja-84, Tartar, Giymatli-2/17, Akinchi-84, Azamatli-95, Nurlu-99, Gyrmyzy gul, Ruzi-84, Gobustan, Tale-38 and others with productivity of 7-8 tons per hectare with excellent quality of grain-grades were obtained. These wheat genotypes are being cultivated widely in Azerbaijan and produced good yield in Turkmenistan, Uzbekistan and Georgia as well;
- The scientific laboratories with modern high-exact devices and the newest equipment were created;
- The skilled and qualified scientists were successfully prepared and trained for scientific researches, who are currently leading scientists in many research centers, and universities of Azerbaijan and around the world (e.g., Commonwealth of Independent States, the USA, Canada, Japan, South Korea, Australia, Israel, and European countries;
- The National Plant Genetic Resources Program was created, Strategy on preservation and rational use of biodiversity was developed. Plant GenBank of Azerbaijan was created;
- Bioethical problems of researches in modern biology, agriculture and medicine were investigated and ways of their solving were established.